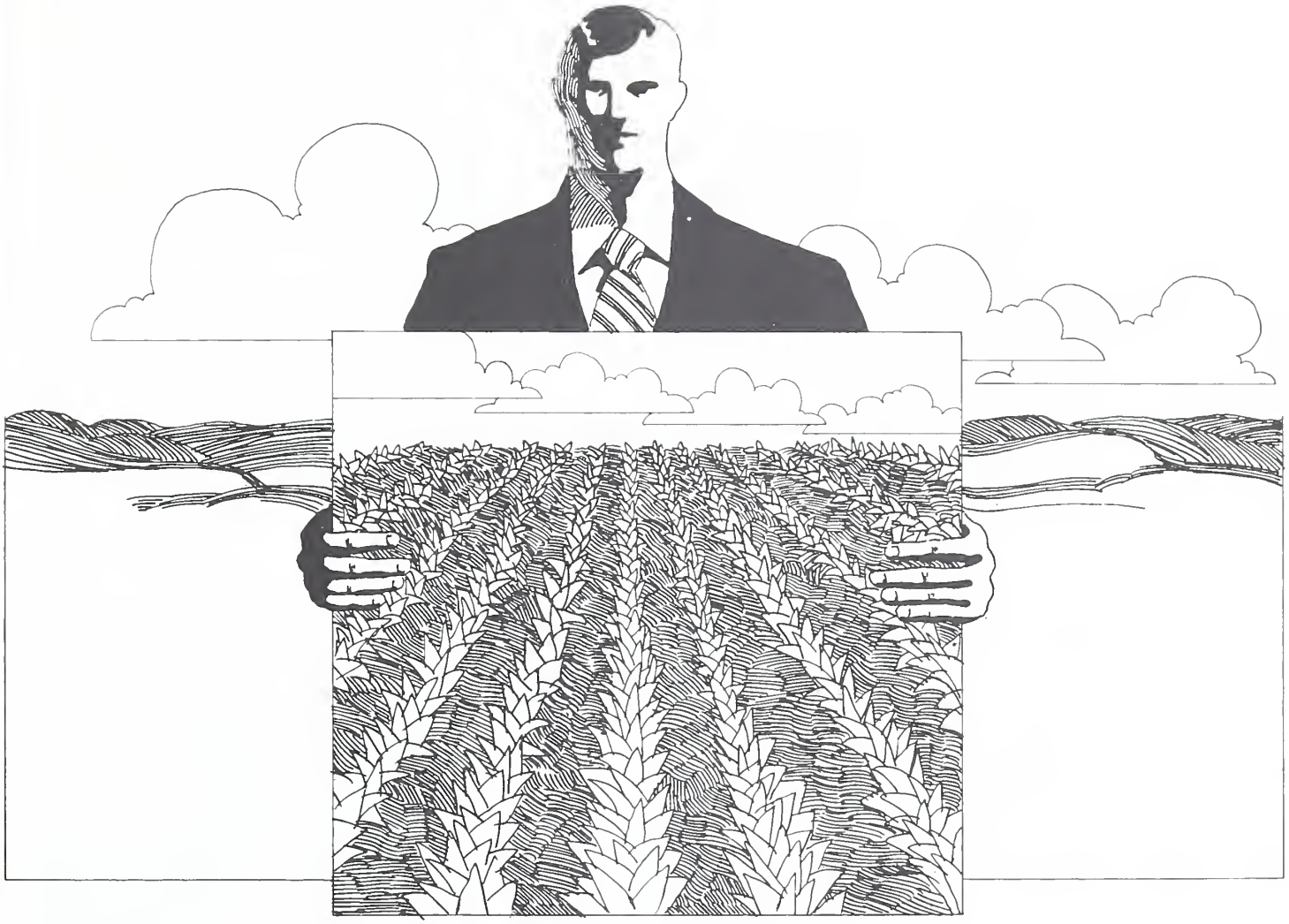

AMERICAN AGRICULTURE

ITS CAPACITY TO PRODUCE

U.S. Department of Agriculture • Economic Research Service • ERS-544

PREFACE

Last year when the demand for U.S. agricultural products was rising sharply, a number of people began to question whether U.S. agriculture had the productive capacity to meet the higher demand level. In late summer 1973 Secretary of Agriculture Earl L. Butz asked the Economic Research Service to evaluate American agriculture's productive capacity.

Materials were pulled together from a variety of sources. Estimates were first made of cropland availability including land suitable for irrigation. Production was evaluated in terms of the level of output that could be obtained with no land held out of production, with adequate input supplies, and assuming U.S. farmers made production decisions based on favorable market prices. The main focus of the effort was on major field crops, specifically those presently utilizing the majority of the land resource. Production capacity for livestock emphasized the capacity for cow-calf operations based on available pasture and forage. The feeding of cattle, hogs, and poultry was assumed to depend on availability of feed concentrates, which depends in part on the level of exports.

The emphasis of this report is on the capacity that could be attained by 1985. This time frame would allow short term restraints to be overcome and a full adjustment made to our long-run capacity to produce. The basic work for the report was done in about one month, thus the materials used were essentially those already available from previous research.

A large number of people in ERS and several persons from other agencies contributed to identification and evaluation of the relevant data. The following listing, though incomplete, recognizes major contributors to the study: Commodity Economics Division - John Stovall, David Culver, Milton Ericksen, Thomas Miller, Leo Strickland, Jerry Sharples, Richard Crom, Wyatte Harman, Roy N. Van Arsdall, Henry Gilliam, Rodney Paul, Ted Moriak, W. Herbert Brown; Natural Resource Economics Division - Howard Hill, Orville Krause, Robert Otte, H. Thomas Frey, Velmar Davis, John Schaub, Larry Schluntz; National Economic Analysis Division - Jim Donald, John Berry, David Bell, Don Durost, Leroy Quance, Robert Hoffman, Allen Smith; Division of Information - Wayne Dexter.

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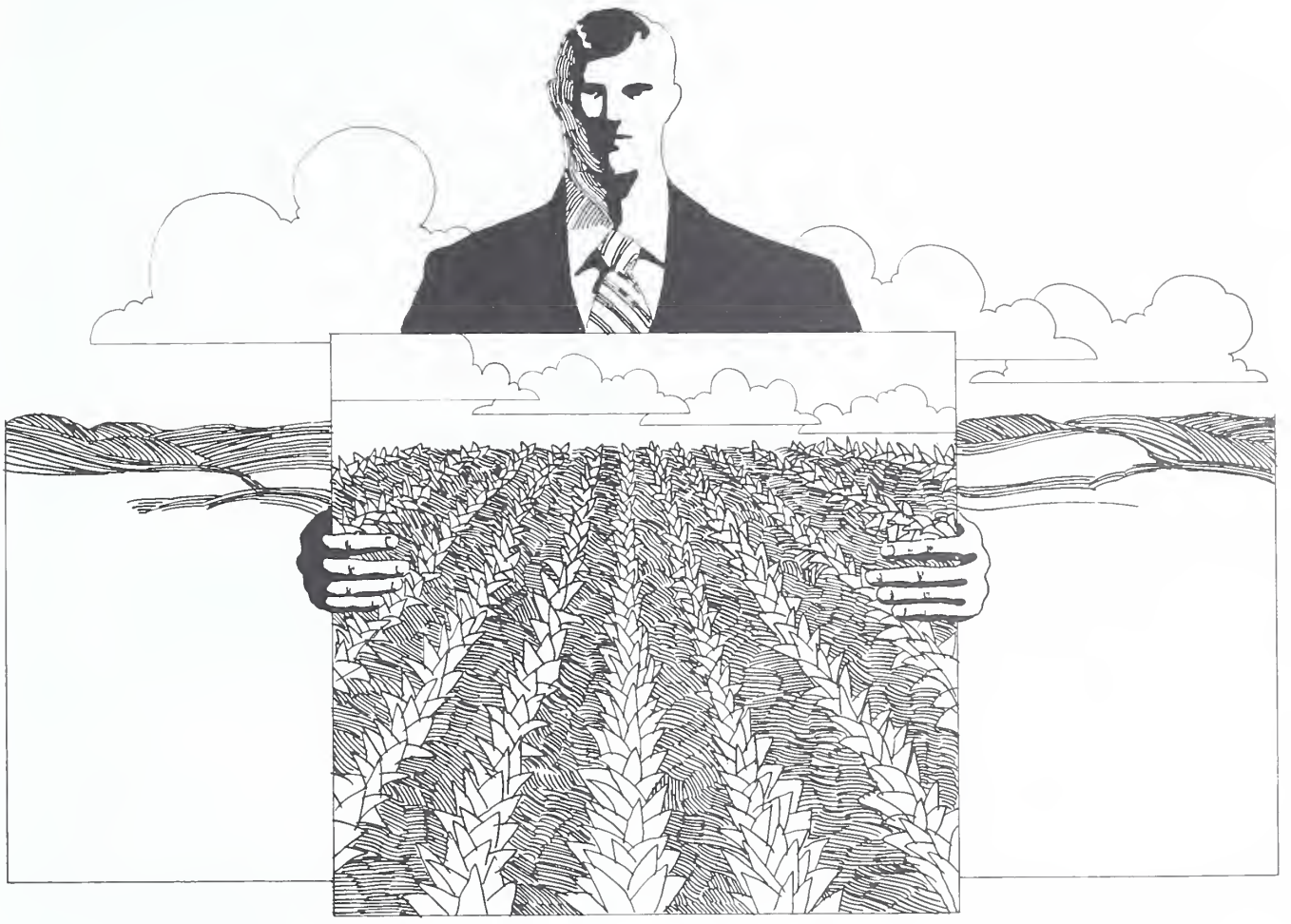


AMERICAN AGRICULTURE

ITS CAPACITY TO PRODUCE

At the request of Agriculture Secretary Earl L. Butz, the Economic Research Service has worked up projections of the production capacity of American agriculture through 1985. The findings, reported here, are intended as a profile of what might happen under a specified set of conditions:

That farm product prices in the future are favorable for increased production.

That there are no restrictions on the use of land.

That supplies of inputs are adequate, and that they are made available at relatively favorable prices.

And, that growing conditions are normal.

The gist of the ERS report—American farmers have the potential to vastly increase their output of the major agricultural products. But note that this relates specifically to potential; there is no attempt to predict whether that potential will be achieved.

Even with a large increase in crops this year, a substantial further gain in production can be expected in 1974, since Government programs will not require farmers to hold any land out of production. Output could continue to climb into the mid-1980's, as more land comes into production and yields mount up.

Part of the greater production capacity would come from expanded use of cropland. But most of the potential would come from higher yields.

In brief, we could—under the conditions outlined in this study—achieve a 50-percent increase in feed grain production by 1985, a one-third increase in soybean production, a 44-percent increase in beef cow numbers, a 30-percent increase in cotton production, a fourfold increase in production of peanuts, and a doubling of rice output.

The whys and wherefores are given in this special 9-page section on "American Agriculture—Its Capacity To Produce."

CROPLAND TRENDS

Since 1950 there's been relatively little net change in the broad categories of land use, despite many shifts within regions. Of the 2.3 billion acres in the U.S. (50 States), cropland still takes up about a fifth . . . grassland pasture and range about a fourth . . . forest land about a third . . . and wasteland about an eighth.

Urban uses claim twice as much land as in 1950 but they still occupy only 1½ percent of the total land area. Highways and airports—despite recent expansions—take only 1 percent.

Although the proportion of all land in cropland has not changed much over the past 25 years, the acreage actually used for crops harvested, fallow, and crop failure declined some 53 million acres between 1949 and 1972—a 14 percent drop from 1949's alltime high of 387 million acres. Part of this decrease reflected a reduction in total cropland, but over half was a result of cropland idled under Federal supply management programs.

Within the comparatively stable U.S. totals there have been important shifts in land use in most regions. All told, since 1950 an estimated 70 million cropland acres have shifted from cropland to permanent pasture, forest land, and urban and transportation uses. Much of the cropland loss took place south and east of the Corn Belt, except in the Delta and southern Florida. East of the Mississippi, land went out of production because of unfertile soils and terrain unsuitable for modern machinery.

However, these losses have been largely offset by new cropland development in certain localities. In Florida, for example, drainage and irrigation brought new land into production. In the Delta States, land was reclaimed through clearing and drainage. Irrigation was chiefly responsible in California, Washington, and the Texas High Plains. In northern Montana, improved methods of dryland farming enabled cropland expansion, and in the Corn Belt, a number of techniques played a role, including drainage, clearing, contouring, and leveling.

Land grazed by livestock has shrunk 13 percent since 1950, but much of it was woodland or land with low productivity for grazing. Overall, grassland pasture and rangeland are about the same as 2 decades ago.

CROP ACRES HARVESTED

Will the downtrend in harvested crop acreage continue? Answer is "no" if prices to farmers are favorable.

Conceivably, with good prices, crop acres harvested could increase

HOW WE USE THE LAND

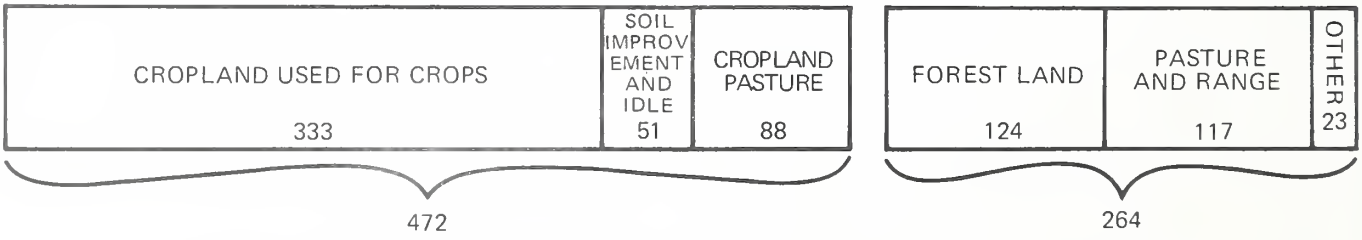
(million acres)[1]

CROPLAND	GRASSLAND PASTURE AND RANGE	FOREST LAND	SPECIAL USE AREAS[2]	OTHER LAND[3]
472	604	723	178	287

1. 1969. 2. Urban areas, highways, parks, wildlife areas, military reservations and farmsteads.
3. Desert, swamp, bare rock, tundra, and similar areas.

OUR CROPLAND INVENTORY..... .....AND WHAT WE CAN TAP[2]

(million acres)[1]



1. 1969. 2. Other land (Class I, II, and III) not in the cropland inventory, but suitable for regular cultivation if improved; excludes Alaska and Hawaii. Source: **Conservation Needs Inventory**, 1967. Soil Conservation Service, USDA.

by 32 million between 1973 and 1985. This would be in addition to a 28-million acre increase between 1972 and 1973.

Altogether, acreage of crops harvested could reach 350 million acres by 1985, 60 million more than in 1972.

Harvested Cropland
(million acres)

Actual	
1969-71 average	292
1972	290
1973	318
Potential	
1980	345
1985	350

The bulk of the increase would come from the return to production of acres diverted under Federal supply management programs, and from cropland pasture. A smaller portion would be shifted from permanent pastures and the remainder would be developed through irrigation, drainage, and clearing. These last two sources are now a part of the 264 million acres (1967 inventory) in land Classes I, II, and III—land not now being cropped but which is suitable for cultivation.

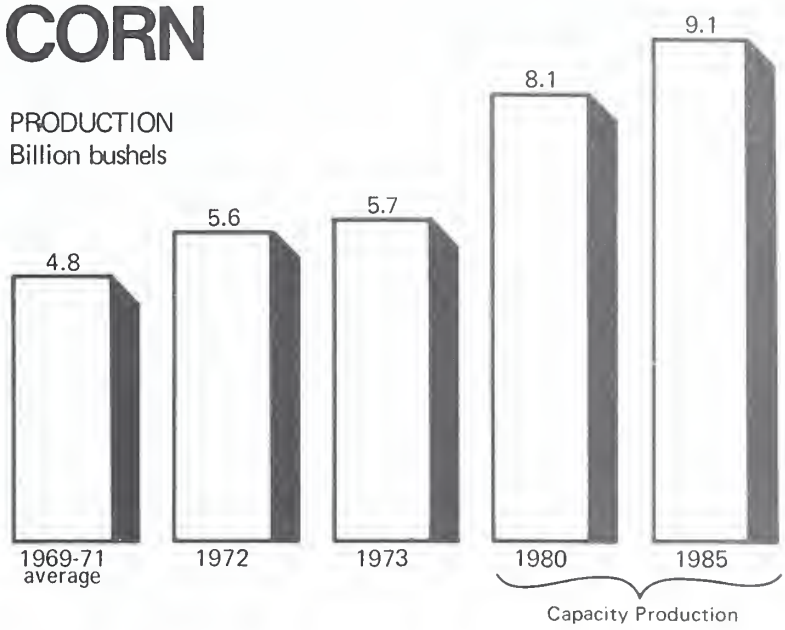
A large percentage of the 264 million acres has the physical potential for crop use. However, it's likely only a small portion will be shifted under the conditions specified in this study. Reason is that forestry would compete with agriculture in some areas, especially the Delta and Southeast. Also, continued favorable cattle prices would slow any shifts from pasture to crop use, inasmuch as land that would most easily be converted to cropland is generally supporting livestock.

PROMISING REGIONS

Odds are that the additions of cropland would be in these areas:

West. Acreage to be claimed would come from public and private irrigation and some increase in dryland cultivation, primarily in the Plains

CORN

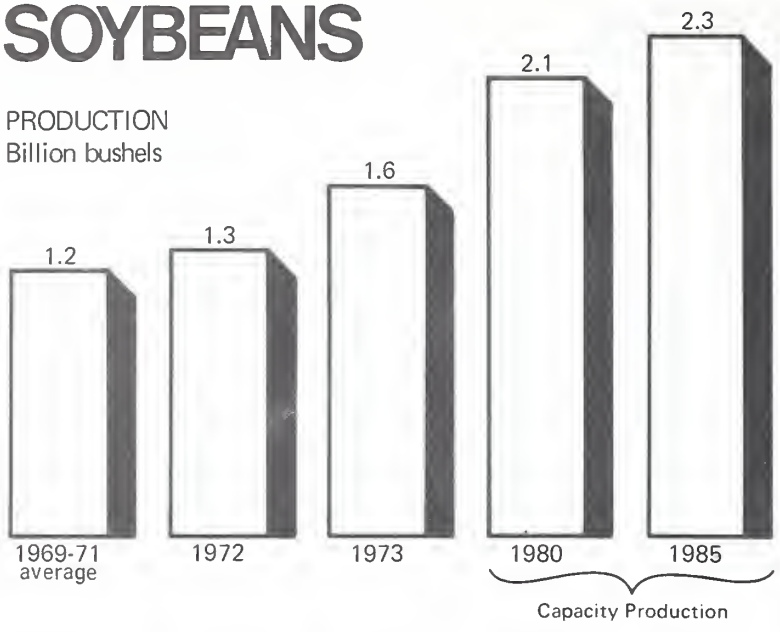


Corn crops may reach 9 billion bushels by the mid-eighties, with much of the expansion in harvested acreage occurring outside the Corn Belt.

YIELDS	
Bushels per acre	
1969-71 average	82.2
1972	96.9
1973	92.4
1980	109.5
1985	120.0

ACREAGE	
Million acres	
1969-71 average	58.7
1972	57.3
1973	61.5
1980	73.7
1985	75.5

SOYBEANS



Soybeans may take up some 65 million harvested acres of cropland by 1985, while output could post a one-third increase over current levels.

YIELDS	
Bushels per acre	
1969-71 average	27.4
1972	28.0
1973	28.0
1980	32.0
1985	34.5

ACREAGE	
Million acres	
1969-71 average	42.1
1972	45.8
1973	56.2
1980	64.1
1985	65.7

States. Hard to foretell is just how much cropland would be added in this region, but in the 1940's, high farm prices stimulated a 20-million acre expansion in dryland cropping.

Southeast and Delta. With favorable prices, cropland area could go up by 5 million acres as a result of stepped-up clearing and drainage projects.

Corn Belt. Attractive prices would encourage reclaiming land that is in small, scattered fields, or has erosion or wetness problems.

A large amount of land in the Northern Cutover, Flatwoods, and Appalachian-New England regions is technically arable. Little would be converted to cropland, though, even under the favorable prices assumed in this study. Most of the land there is in small, scattered fields with cultivation problems. Much has been cropped in the past but has since been abandoned.

PRODUCTION POTENTIAL

For the first time since 1956, farmers in 1974 will not be required to hold any land out of production. The impact will be felt immediately in greater use of cropland.

Beyond 1974, over the next decade and a half, crop output under the conditions in this study would outpace the growth rate of the last 15 years. Farmers would continue to bring more land into production and yields would continue to climb.

With all-out production, corn crops of the mid-1980's could reach 9 billion bushels. And total feed grain production could be 50 percent over the record 1973 level.

The soybean crop by 1985 could register a one-third increase and could equal wheat production.

Cotton could reverse its long-time downtrend and rise about 30 percent.

Production increases could be dramatic for peanuts and rice, both of which have been under tight acreage controls.

Rice output—with favorable prices and no controls—could double. Pea-

nut production could increase three or fourfold. However, rice and peanuts would still command only a minor part of the Nation's cropland resources.

Near term growth in livestock production cannot be as striking as for crops. Immediate prospects, especially for beef cattle and dairy, have been largely determined by production decisions farmers have already made.

By 1985, however, if prices remained favorable, beef cows could jump to 59 million from the 41 million in 1973—a gain of 44 percent.

Beef and veal output is projected to go from 21.7 million pounds in 1973 to 35.3 million in 1985, and beef consumption from 112.7 pounds per person to 159, based on supply.

The potential for expanded hog and poultry production depends mainly on feed availability, rather than on the cropland base. Thus, no projections for production are contained in this study.

IRRIGATED LAND

Acreage under irrigation is expected to grow from 35½ million in 1973 to 38½ million in 1985. This is based on potential private development and projects authorized and funded by the Bureau of Reclamation.

One factor limiting greater expansion is the relatively long time needed for irrigation development.

Other restraints:

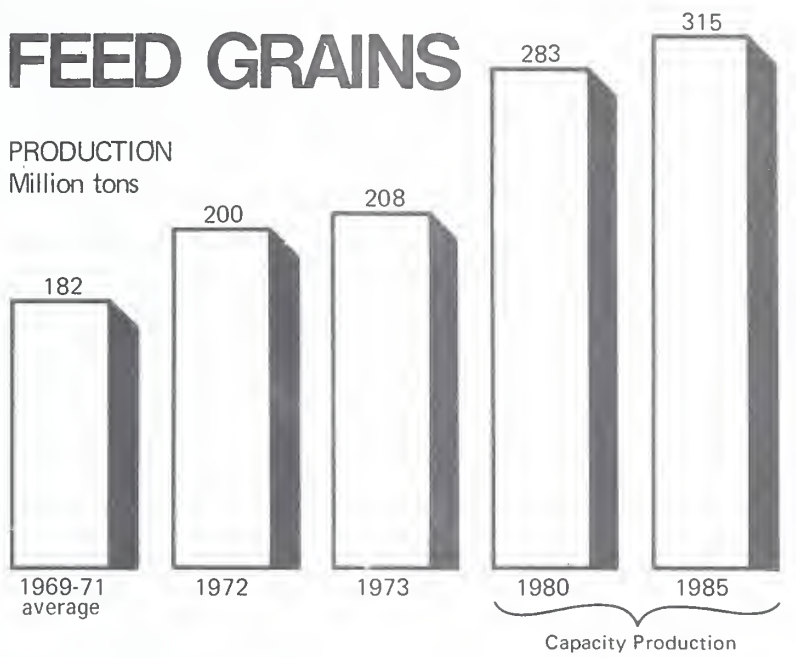
√ Limited availability of water for private development

√ Environmental concerns which may put brakes on drainage and clearing, particularly in coastal areas

√ Probable loss by 1985 of 840,000 acres of irrigated land in Texas because of the declining water table.

Over the next 10 or 15 years, irrigation development is projected for Florida for fruit and vegetable production, and for the Delta States, primarily for rice and cotton.

There could be further development in Nebraska, Kansas, and North Dakota. Increases are pro-



Feed grains, piling up acreage and yield increases, will continue to set production records. Total output in 1985 may soar 50 percent over 1973.

YIELDS	
Tons per acre	
1969-71 average	1.81
1972	2.13
1973	2.03
1980	2.47
1985	2.72

ACREAGE	
Million acres	
1969-71 average	100.4
1972	94.1
1973	102.4
1980	114.7
1985	115.7

jected for Oklahoma and Texas through 1980, followed by a dropoff in irrigation due to depletion of water in the Texas High Plains.

Added acreage in the Mountain States would come primarily from limited public development. Development in the Pacific States would be mainly due to public projects in Washington and Oregon, and to implementation of the State water plan in California.

CROP YIELDS: ALL FARMERS VS. TOP 10 PCT.

Crop	All farmers		Top 10 percent producers	
	1969-71 Average yield	1972 Average yield	1972 yield	Percentage of 1972 average
	Bushels per acre			
Corn	82.2	96.9	143.4[1]	148
Winter wheat	33.3	34.0	50.7[2]	149
Soybeans	27.4	28.0	44.7	160
Cotton (pounds)	437	507	926[3]	183

[1] Excludes yields on irrigated fields in Kansas and Nebraska. [2] Excludes irrigated wheat yields. [3] Includes irrigated cotton in Arizona and California.

YIELDS CRUCIAL

Higher crop yields would contribute the biggest part of the increase in production potential. They would mainly come from increased use of the same technology that boosted yields in the last 2 decades—hybrid seed, greater use of fertilizer and irrigation, improved machines, narrower rows and higher plant populations per acre, chemical weed control, continuous cropping of corn and other high yielding crops. In the future, better management should result in better combinations of inputs and cultural practices.

Tending to slow down the rise in national average yields:

√ Much of the expansion in corn acreage would be outside the Corn Belt where yields usually run lower

√ Most of the increase in wheat acreage would come in fallow areas of the western half of the U.S. where yields are lowest

√ Some land in fallow areas would be continuously cropped, and this would reduce average yields per acre.

MANAGEMENT SKILLS

One of American agriculture's most promising potentials lies with wider application of management skills the Nation's leading farmers are already using. For several important crops, leading producers are routinely getting yields that are at least 50 percent higher than the national average.

Supposing all producers achieved the same yields as the top 10 percent?

All producers cannot in fact reach the levels of the highest tenth, but the tremendous possibilities are shown in the table above.

OTHER POSSIBILITIES

The ERS projections are based on economic potential. They fall well short of the maximum for bringing more land into production and for raising the productivity of both crops and livestock. Obtaining peak performance would require additional public and private programs for land development, and stepped-up programs of research and education in agricultural production.

The projections in this study may be conservative since they did not consider new production possibilities that are now in some stage of research and development. These include:

Crops. Hybrid varieties are being developed for wheat, barley, and soybeans that with a concerted push might be ready for commercial use within 10 years. Hybrids for wheat —with indicated yield increases of 15 to 25 percent—are now available in very limited quantities, but another 5 to 7 years may be needed for these varieties to make a major impact on wheat production.

Higher protein content is possible with new grain varieties. Developments are further along for food grains than for feed grains.

Insect-resistant plant varieties would reduce the cost of insecticides and ease the environmental problems from chemical residues. However, development will probably require several more years.

Livestock. Crossbreeding and artificial insemination of beef cows could result in a 20-percent increase in production. These practices have been slow to catch on. The major limitations appear to be the lack of technical expertise and the need for further refinement of breeding practices.

Multiple births, or twinning, in beef cattle offers a big potential for lifting efficiency in beef production. The technology to do this is not yet available but research reports have been encouraging.

Feeding efficiency has room for improvement, and researchers are looking into the possibilities, including greater use of straw for feed—now largely a waste product—and use of manure as a protein source.

Double cropping. A major research and extension effort could probably bring a hefty expansion of double cropping. At present some 4-5 million acres are being double cropped. This involves the planting of a short season summer crop—such as soybeans or sorghum—after harvest of a winter or early spring crop, such as wheat, oats, or barley.

The potential for double cropping has been greatly increased as a result of these recent developments: early maturing varieties of small grains, soybeans, and sorghum; minimum or no-till planting equipment that allows the second crop to be

planted directly in the old crop stubble; chemical weed control so that no cultivation is needed; and greater availability of drying equipment.

SOME PROBLEMS

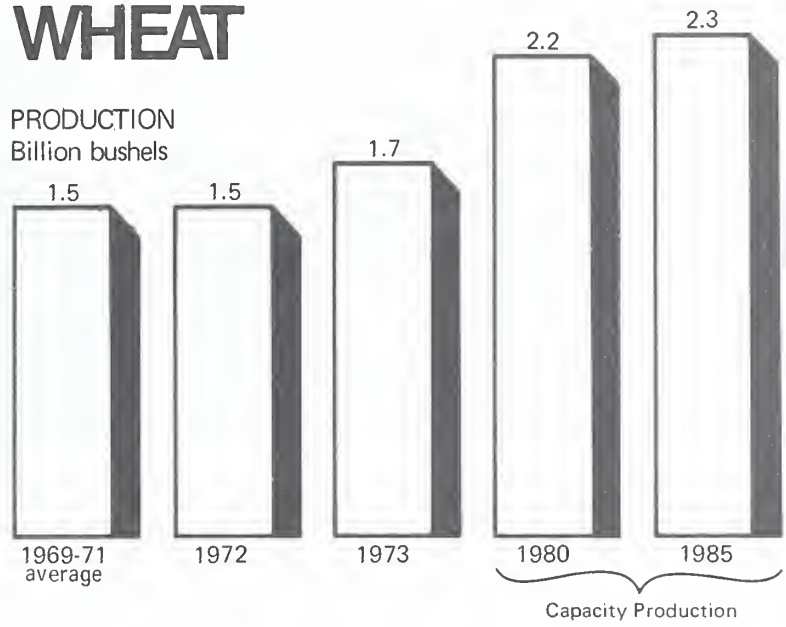
This study assumes adequate supplies of farm inputs at normal prices, moderate environmental restraints, and adequate marketing and transportation facilities. There are, nonetheless, developments that could reduce output below levels projected.

Fertilizer. Next year may find nitrogen and phosphate fertilizers short of demand because of increased acreage, higher application rates, and strong foreign demand. Over the longer run, supplies of potash and phosphate should be adequate. But there is concern over the availability of nitrogen fertilizer because of the shortage of natural gas.

Fuel. Farmers account for only about 3 percent of the Nation's gasoline, diesel fuel, and electricity consumption. Difficulties may arise in the short run in that prices are apt to escalate sharply even though shortages may not be a continuing problem. Also, about half of the motor fuels are used during the April-July planting period, with a secondary peak during the fall harvest. Seasonal shortages are always a possibility, particularly shortages of liquid petroleum gas for crop drying.

Labor. The labor picture will take on new dimensions in future years. Sound labor management practices will be more essential than ever before. More of the labor force may be hired rather than supplied by family members—possibly above one-third by 1980 against one-fourth in 1972.

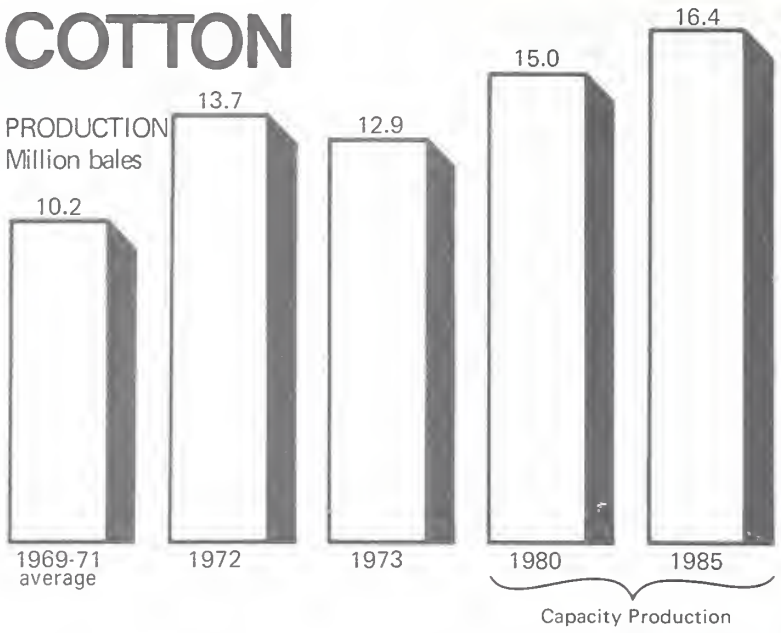
Farmers will have to pay more to attract the skilled workers to operate the increasingly complex machinery and equipment. Minimum wage rates for farm workers will probably be the same as for nonfarm workers. Unemployment insurance for farm workers is likely to be written into law, and collective bargaining will become more common.



Wheat harvests under all-out production could surge 40 percent over the present mark. New hybrids only recently available stand to sharply boost average yields.

YIELDS	
Bushels per acre	
1969-71 average	31.9
1972	32.7
1973	31.8
1980	34.5
1985	36.6

ACREAGE	
Million acres	
1969-71 average	46.1
1972	47.3
1973	53.7
1980	62.3
1985	62.3



Cotton production, in an about-face from its long decline, could register a 30-percent increase under full productive capacity.

YIELDS	
Pounds per acre	
1969-71 average	437
1972	507
1973	502
1980	510
1985	535

ACREAGE	
Million acres	
1969-71 average	11.2
1972	13.2
1973	12.4
1980	14.1
1985	14.7

Storage and transportation. As in recent years, there will be recurring problems.

Environmental restraints. Federal regulations to improve water quality are now being set up. They will apply to waste discharges from agricultural processing plants and livestock feedlots. By 1977, firms will be expected to use the best practicable control technology that is then available. And by 1983, firms must adopt the best available technology that is economically possible.

This will mean some small fruit and vegetable processors, tanners, and others will be forced to close down. This may cause regional shifts in the industry with intermittent shortages until larger firms can expand their capacity.

About a fourth of the fed beef producers are expected to have problems in controlling surface water runoff. Small producers, who may not be able to afford the control devices, will be hardest hit, and the regulations may hasten the trend toward larger operations.

Roughly two-fifths of present dairy operations will have water runoff problems. Production systems will need to be changed. The impact on production could be significant.

A fifth or more of all hog producers will have to adopt new ways for handling surface runoff. The impact in the near term will be lower hog production and higher prices. There will probably be no great impact on prices over the longer pull.

To avoid severe repercussions on land use, a concerted effort will be needed to develop and disseminate improved systems of management for crops and livestock that will meet environmental needs without excessive disruption. With sufficient time, farmers will probably be able to work out efficient solutions for these environmental problems.

[From materials developed by several ERS researchers. For further information, contact David W. Culver or Milton H. Ericksen, Commodity Economics Division.]

TOWARD MORE EFFICIENT PRODUCTION. U.S. farmers have tractors harnessing some 212 million horsepower on farms today. With the trend toward larger and more efficient farm machinery, the average horsepower of tractors purchased last year reached 78, and close to a third of all new tractors—as that shown above—had 100 horsepower or more. Another advance is the once-over operation, such as at the upper right, where a plateless corn planter applies insecticide, herbicide, and fertilizer, all in one trip over the field. What's ahead? Such equipment as a forage processing machine, below, that could be used by a hay farmer or rancher in 1980. Turbine-powered, it is planned to put up 15- to 20-pound cow-ration sized bales from windrows at a rate of 20 tons an hour. Bales would be encased in edible, weatherproof polypropylene plastic—made and fortified with vitamins and minerals in the forage machine itself.